QA39 - Low Hemoglobin in Infancy

QUESTION:

I have a 4 month old male infant enrolled on WIC with a birthweight of 8 lbs.3 ounces. A toe stick at 3 ½ months resulted in a hgb value of 8.1 g/dL. A second check had hgb at 9.0 g/dL. The mother feeds the infant 3-4 8 ounce bottles of Enfamil with iron/24 hours. She prepares the formula correctly. He is neither eating nor drinking anything other than Enfamil. The infant now weighs 19 pounds and measures 27 inches. He has had at least one incident with seizures but appears otherwise healthy.

I would like to know if these low hgb values are relevant and considered a health risk in a 4-month-old infant. If so, what might be the cause of the low hgb.?

ANSWER:

Hgb concentration is a widely used screening test for iron deficiency. Hgb concentrations are normally higher at birth with the fetus acquiring substantial iron stores in utero. There is a gradual decline in Hgb levels from birth to 2 months, followed by a gradual decline in iron stores from 2 months to 4 months. After 4 months, without an adequate dietary source of iron, the infant is unable to maintain adequate iron status in the face of rapid growth and need to increase red cell mass. A declining Hgb concentration represents the end stage of iron deficiency. The infant may be particularly vulnerable during rapid growth, inappropriate feeding, or when fetal stores are somewhat low to start with.

With this said, reliance on any single test to determine nutrient deficiency or adequacy may be problematic. Hgb concentrations may be subject to error. It may also be influenced by non nutritional factors. Dilutional effects from sampling technique and inflammatory responses during illness may alter Hgb levels unrelated to iron status. Levels may also be reduced with certain thyroid, liver, or hemolytic conditions; or with blood loss.

This infant appears to have sustained a rapid rate of growth from birth to 4 months and is already greater than 2X his birthweight. By report he is on an appropriate iron containing formula (although at this time his intake appears to be about 111 cc/kg/d and 74 kcal/kg/d - ? perhaps on the low side). What his stores were at birth are not known. Low stores and rapid growth may have depleted limited stores. Conversely one might be reaching a physiologic nadir and the level may rise, or he may be in the midst of some acute illness. It is uncertain at this time if he is iron deficient from Hgb levels alone. Ruling out other causes, verifying the accuracy of diet information, repeating the test and/or obtaining additional iron studies may clarify the situation more.

References:

1) L.J. Filer: Dietary Iron Birth to Two Years, Raven Health Care Communication 1989.

2) Lonnerdal Bo: Iron Metabolism in Infants, CRC Press 1990.